In **Unit One**, students read and analyzed graphs about the labor market in general, and learned about job trends specific to the Technology sector. They also learned about the different types of employers in this sector.

In **Unit Two**, students reflected on their own work history, as well as their personal values and interests. They also practiced using career databases such as New York State’s CareerZone and Career Cruising.

In **Unit Three**, students learned about different factors that can impact the choice to change careers. They also learned about different career paths in Technology, as well as how to access the training and education required to pursue these careers.

In **Unit Four**, students explored the daily realities of various Technology careers through detailed worker narratives.

In **Unit Five**, students learn about the ways that technology affects our society, including how it is re-shaping the job market, how demographic factors such as race and gender play out in the Technology workforce, and how technology is affecting young people and education.

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**1 • Calculating and Notating Exponents: The Growth of an App**

Students practice calculating and notating exponents, while considering how a smartphone app can grow through word of mouth. Optional extension questions include work with the TI-30XS calculator, the official calculator of the TASC exam.

**2 • Listening & Taking Notes: What Is Coding?**

Students watch videos and practice note-taking while learning about computer coders.

**3 • Graphing: Women & People of Color in STEM**

Students read statistics about the numbers of women and racial/ethnic minorities in STEM fields, then create bar graphs based on the text.
3.1 • Researching a Biography: STEM Role Models of Color
Students research and present the biographies of people of color who have made important contributions to STEM fields.

4. ADVANTAGES AND DISADVANTAGES: HOW IS TECHNOLOGY AFFECTING EDUCATION?
Students read multiple perspectives on how technology is affecting education. After reading and discussing, students conclude whether technology has a positive or negative affect on education, then do a quick-write or a short written response.

5. READING & WRITING TO GIVE ADVICE: HOW DOES SOCIAL MEDIA INFLUENCE TEENAGERS?
Students discuss and read about the possible ways that social media can affect teenagers, and write a letter of advice to suggest and explain strategies for avoiding some of the pitfalls discussed in the reading.

6. A CASE STUDY SERIES: E-NABLE AND TECHNOLOGY FOR SOCIAL CHANGE
Students take an in-depth look at a Technology nonprofit that uses open source design and 3D printing to create free experimental upper limb prosthetics for children and teens.

6.1 • Videos and Note-taking: An Introduction to e-NABLE
Students watch videos, practice notetaking, develop questions for further inquiry based on their notetaking and write short answers to fact-based and opinion-based questions.

6.2 • Percentage of Growth: The e-NABLE Community Foundation by the Numbers
Students analyze data from the e-NABLE Community Foundation to practice calculating percentage of growth.

6.3 • The Path from Volunteer to Employee: e-NABLE and Po Paraguay
Using the jigsaw collaborative reading strategy, students read and answer questions about Po Paraguay, a nonprofit organization that developed out of the e-NABLE community. Students also learn about the potential for volunteerism to build job skills and create opportunities for employment.

7. LIFE HACKER: TECH RESOURCES TO MAKE YOUR LIFE EASIER*
Students practice critical thinking skills while learning about local resources. They research local and regional websites and mobile apps that provide assistance and services with real life problems, then respond to scenarios, identifying the appropriate resource for the situation.
Calculating and Notating Exponents: The Growth of an App

Students practice calculating and notating exponents and powers of two, while considering how a smartphone app can grow through word of mouth. Optional extension questions include work with the TI-30XS calculator, the official calculator of the TASC exam.

Adapted from Unit 6 of the CUNY HSE Math Curriculum Framework, which has additional teaching resources on the topic.

PREP

- Do the activity in its entirety in preparation for doing it with students. If using the TI-30XS calculator, teachers should be familiar with how to enter exponents.

MATERIALS

- The Growth of a Smartphone App handout
- The Powers of Two handout

EXPLAIN

1. Ask students to get into groups of 2-3 students.

2. Notice/Wonder: When we look at a math problem today, I’m going to ask you two questions; What you notice and what you wonder. With the first question, I’m asking what you see and what is interesting to you. With the second question, I want to know what questions you have and what you want to know more about.

3. Draw a T chart on the board (You’ll add notes later):

<table>
<thead>
<tr>
<th>What do you notice?</th>
<th>What do you wonder?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Distribute *The Growth of a Smartphone App* handout. Ask students to read the paragraph a few times, then write responses to the two questions. Assure them that they will have ample time to share what they are writing.

Ask students to turn to a partner and share what they noticed and what they wondered for two minutes.

As a whole group, ask students to share some of the details they noticed. They may say things like:

- Every day more people download it.
- It starts with two people.
- From the first day to the second day, the number of downloads doubles.
- Eight people would download the app on the next day.

Ask students to share some of the things they wondered. They may say things like:

- How many people will download it after ______ (amount of time)?
- What kind of app is it? What does it do?
- How much does it cost?
- Why does each person only tell two other people?

These are all great wonderings/questions. Another is, How many people altogether will have downloaded the app after seven days? Write question on the board. Ask students to write it on the top of a clean sheet of paper.

How many people altogether will have downloaded the app after seven days?

Before you work on that, take 30 seconds to estimate an answer. On your paper, write your best guess for how many total downloads there would be after seven days.

Ask for student volunteers to share their best guesses and record them on the board.

Ask students to start working on the problem on their own. After five minutes, ask students to share their work and thinking with the other students in their group. It’s okay if they feel they haven’t completed the problem yet.
While you are listening to the groups, look for students who drew pictures or tables to keep track of the number of apps downloaded for each day. Many students will start off drawing stick figures or a tick mark to model the number of downloads. Usually by the fifth day, that method will prove unwieldy and students will abandon it. If any students give up, ask them if they notice any pattern in the number of downloads for each day. Even if they stopped before they got to seven days, they should be able to see that the number of downloads for each day is double the number of downloads from the preceding day.

**Extension/Push Questions:** For students who finish early, ask them to talk you through their process. Once they have expressed their reasoning clearly, you can ask them one of the questions below to keep them engaged while the rest of the class is working.

a. Assuming the patterns continues, how many people would have downloaded the app on the 14th day?

b. Let’s say each download costs $0.99 and Raquel gets to keep one-third of that money. How much does she earn each day for 1 week? 2 weeks?

c. Ask students if they can find a way to figure out how many downloads there would be on any day, assuming the same pattern continued.

d. How would the number of downloads grow if each person who downloaded it told three people rather than two.

Bring the group back together and ask students to share their answers for the number of downloads after 7 days. Record answers on the board without responding or reacting. After each one, ask for a show of hands of those who got a similar answer. Then ask if anyone got a different answer and repeat until all answers are up on the board. Chances are you will have some of the following answers:

a. 128 (the number of downloads on the 7th day)

b. 254 (the number of total downloads on days 1 through 7)

c. 255 (the number of total downloads on days 1 through 7, including Raquel)

d. Other answers that are close but reflect minor calculation errors.

Ask students to explain their answers, giving the rest of the class an opportunity to appreciate one thing about their strategy and ask questions about it.
Once students agree on the answer, ask them how the answer compares to their best guesses at the beginning. What might account for how close/far off we were?

Distribute *The Powers of Two* handout. Ask students what they notice. Specifically ask them about the 3rd column and what it might represent. Once they understand that the third column is a way of explaining the calculations in the second column, ask them to complete the first three columns in their entirety. Students can ignore the fourth column for now. Completed, the chart will look like this:

<table>
<thead>
<tr>
<th>Day</th>
<th>New Downloads on that Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
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<tr>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
</tr>
<tr>
<td>6</td>
<td>64</td>
</tr>
<tr>
<td>7</td>
<td>128</td>
</tr>
<tr>
<td>8</td>
<td>256</td>
</tr>
<tr>
<td>9</td>
<td>512</td>
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<td>10</td>
<td>1024</td>
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<tr>
<td>11</td>
<td>2048</td>
</tr>
<tr>
<td>12</td>
<td>4096</td>
</tr>
<tr>
<td>13</td>
<td>8192</td>
</tr>
<tr>
<td>14</td>
<td>16384</td>
</tr>
</tbody>
</table>

When students complete the chart, ask them to write the following title in the 3rd column: *Multiplying 2’s*.

Ask students if any of them know another way to write all of those 2 times 2 times 2 times..., without having to write them all out.

- Either through drawing it out of a student, or telling them yourself, have students fill in the fourth column: 22, 23, 24, etc.
- Ask students to write the following title of the 4th column: *Powers of 2*.
- To find out the number of downloads on any given day, you can use the function: \( y = 2^n \), where \( n \) is how many days after the first download and \( y \) is the number of downloads on that day.
To develop vocabulary, make sure students understand:

- The smaller number that is raised up slightly is called an “exponent”.
- \(2^2\) can be read as “two to the second power” or “two squared”.
- \(2^3\) can be read as “two to the third power” or “two cubed”.
- All of the others are read as “two to the (1st, 2nd, 3rd, …) power”.
- Once students seem to understand that to find the number of downloads on any given day, we calculate \(2^n\), explain that this kind of growth is called exponential. In exponential growth, the variable will always be in the exponent position, that is, raised, and it will often represent units of time.

**EXTENSION ACTIVITY: USING TI-30XS CALCULATORS**

Distribute the calculators.

- Ask students to find the caret button: 
- Explain that to enter \(2^7\), press “2,” then \(\uparrow\), then “7” and finally \(\downarrow\).

**Ask students:**

How many downloads would there be on 14th day? Use your calculator to find out. How many would there be on the 16th day? Use the calculator. Now, how many total downloads would there be by the 16th day?

As a final extension problem, ask students how many days it would take until there are over one million total downloads. Some students may say that is takes 20 days for the total number of downloads to rise above one million because \(2^{20}\) is 1,048,576, but it is actually after 19 days that the total number of downloads exceeds one million. When students enter \(2^{20}\), that 1,048,576 is the number of downloads on just that day! To find the total, they will be using the exponents to find the daily downloads, but they will still need to add those numbers together to find the total.
The Growth of a Smartphone App

Raquel developed a smartphone app. On Monday, she told two of her friends about it and they downloaded it. The next day, those two friends each told two other friends and each of them downloaded it. Assume that this pattern continues and each new person who downloads the app tells two of their friends about it, who each download it.

What do you notice?

What do you wonder?
## The Powers of Two

<table>
<thead>
<tr>
<th>Day</th>
<th>New Downloads on that Day</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>$2 \times 2$</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>$2 \times 2 \times 2$</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>128</td>
<td></td>
</tr>
</tbody>
</table>
Listening and Taking Notes: What is Coding?

Students practice note-taking skills while learning about computer programmers through video.

PREP

- Watch videos from the “Mentors” section of madewithcode.com, including “EPA Chica Squad” and “Saved w/ Code”.
- Ask students to bring headphones if they have them, for this activity.

MATERIALS

- Computers and headphones
- Notes on Coding handout

EXPLAIN

1 Many jobs in Technology today require coding skills. Ask students if they know what coding is.
   - Coding is the writing of letters, numbers and symbols to make a computer execute specific tasks. Apps (applications) and software are written with code.

2 Tell students that today they will watch videos about coders. In addition to learning about coding, which may be a job they want to pursue, they will also practice note-taking. Why is note-taking important?
   - Taking notes is a way of recording ideas you want to remember. You can look at the notes later to remember an idea you might have forgotten. Sometimes the mere act of writing things down helps people remember. Note-taking is required in many courses, including courses in certificate and degree programs. It is also an important life skill that can be used on phone calls, at medical appointments, parent-teacher conferences and anytime you want to remember something important.

3 If available, use a computer with projection. If not, have students navigate to madewithcode.com on their computers and scroll down to the Mentors section of the page and show the highlighted video. Ask students what they can learn about coding from it, and how this compares to what they had previously known about coding.
4 We are going to watch another video together to practice taking notes. You will watch it twice. The first time, try to identify the big ideas and write questions you have about the video. On the “Mentors” page https://www.madewithcode.com/mentors/ scroll to the video “Saved W/ Code: Erica Kochi”.

5 Distribute the Notes on Coding worksheet. After watching the video once, give students 3 minutes to write down everything they can remember from the video in the Notes section, along with any questions about what they want to find out when they watch the video again in the Questions section.

6 Ask students to share what they remember from the video and their questions. Take notes on the board.

7 Show the video again. Give students 5-10 minutes to write down more notes about the video in the Further Notes section.

8 Tell students that they should now individually choose a video from the Mentors section of the website and take notes on it on the reverse side of the page. Remind students to watch each video twice. If students finish taking notes on one video early, they can watch another.

DISCUSS

- What did you learn about coding?
- What additional questions do you have about coding?
Notes on Coding

1. After watching the video, write down the main ideas and any questions you have.
2. After watching it a second time, take notes about further information you learned.

**WEBSITE:** https://www.madewithcode.com/mentors

<table>
<thead>
<tr>
<th>Coder 1: <em>Erica Kochi</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Questions:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Further Notes:</td>
</tr>
</tbody>
</table>
Research a coder of your choice, from the “Mentors” section of https://www.madewithcode.com/. Take notes on this video as you did for the first.

<table>
<thead>
<tr>
<th>Coder 2: __________________________</th>
</tr>
</thead>
</table>

Notes:

Questions:

Further Notes:

What did you learn about either coding or note-taking today? Are you interested in learning more about coding? Why or why not?
Graphing: Women & People of Color in STEM

Students read and discuss an article about the gender and racial disparities in math and science fields, make a bar graph based on information in the article, then research well-known women and people of color in STEM fields.

PREP

- Read *Minorities and Women Still Underrepresented in STEM Fields, Study Finds* article.
- Complete *Graphing Demographics in STEM Fields* worksheet to be used as an answer key.

MATERIALS

- *Minorities and Women Still Underrepresented in STEM Fields, Study Finds* article
- *Graphing Demographics in STEM Fields* worksheet

EXPLAIN AND DISCUSS

1 STEM is an abbreviation that stands for Science, Technology, Engineering and Math. Educators and policy-makers frequently use this term as these fields expand, as colleges expand their offerings in these fields, and as high schools and High School Equivalency programs prepare students to enter these fields of work.

We’re going to read an article about the number of women and people of color working in STEM fields. It’s an issue that has been in the public eye in recent years, and one that President Obama strongly advocated for during his time in office.

3 Distribute *Minorities and Women Still Underrepresented in STEM Fields, Study Finds* article. Ask students to read it once for the main ideas. Once they are finished reading, ask students to discuss the main ideas with a partner.

4 Ask pairs to complete the bar graph based on the information in the article.

5 Discuss answers as a class using your prepared answer key.
Minorities and Women Still Underrepresented in STEM Fields, Study Finds

By Alan Neuhauser, Feb. 6, 2014, US News


America’s science and engineering sectors have made strides toward building a more diverse labor force, but progress remains to be made, the National Science Board’s annual “Science and Engineering Indicators” report found.

“There has been some general movement toward more diversity of participation in S&E [science and engineering] occupations,” the report, released Thursday, said. It also noted, however, that “despite this increase, participation varies substantially across groups.”

Asians, for example, made up 19 percent of scientists and engineers in the United States in 2010—far higher than their proportion in the general population, which was 5 percent.

By contrast, African Americans, Hispanics, American Indians and Alaska Natives, “historically underrepresented racial and ethnic groups,” the report described, accounted for 10 percent of the country’s workers in science and engineering in 2010—up slightly from 7 percent in 1993, but still a far smaller proportion than their share of the general population, which was 26 percent.

Women were also underrepresented in the science and engineering workforce. While they represent half of all college-educated workers in the United States, they made up just 28 percent of science and engineering workers in 2010—an increase from 21 percent in 1993.

Science and engineering industry leaders have called on both businesses and educators to help make the sectors more diverse. At a “STEM Saves Lives” conference hosted by U.S. News and the pharmaceutical lobby last month, speakers urged teachers and parents, in particular, to help break down expectations of what scientists and engineers should look like.

“What is a scientist to you? What does that mean?” said Carmela Mascio, a senior research associate at the company Cubist. “Make it real to students. Make it possible.”
Graphing Demographics in STEM Fields

Create bar graphs that reflect the statistics in the article by shading in the boxes below where 1 box = 10%.

Write a summarizing statement about gender in STEM based on these graphs.

Write a summarizing statement about race and ethnicity based on these graphs.
Researching a Biography: STEM Role Models of Color

In groups, students research a STEM professional of color, with whom they are not already familiar, and present their research to the class. This activity may be divided over several class periods to allow time for research and preparation of presentation.

MATERIALS

- *STEM Professional of Color* chart
- This lesson requires computer use.

EXPLAIN

1. Data from technology companies show that people of color are underrepresented in STEM fields. In other words, the ratio of white Technology workers to Technology workers of color is very out of proportion to what we would expect given the percentage of people of color in the population as a whole. Furthermore, when people of color are present in Technology companies, their presence is sometimes minimized or even rendered invisible, due to a lack of recognition for their contributions.

   In an effort to make the contributions of people of color in STEM more visible and widely known, you are going to research a person of color, living in the present or past, who made important contributions to a STEM field. It could be a doctor, inventor, astronomer, chemist, etc.

2. Ask students for examples of STEM professions and write them on the board.

   - Astronomer, Computer programmer, Inventor, Physician, Chemist, Astronaut, Architect or Builder, Engineer, Geologist, Biologist, Botanist, Conservationist, Pharmacist.

3. Divide students into groups of four, and ask each group to choose one STEM profession they would like to focus on.

4. Ask students to conduct internet research to identify an important STEM professional of color, living now or in the past, they would like to learn about. They can continue working together as a group, researching one STEM professional together, or can branch out according to their own interests.
5 Distribute the *STEM Professional of Color* chart and ask students to complete it based on the information they find. They will use this chart when presenting their STEM professional to the class.

6 **OPTIONAL:** As an additional step, teachers can have students transfer their chart into a Powerpoint presentation. A Powerpoint tutorial can be found here: [https://support.office.com/en-us/article/create-your-first-powerpoint-2010-presentation-50732ad4-49b3-44c1-9b4d-fa5e73eb47d1](https://support.office.com/en-us/article/create-your-first-powerpoint-2010-presentation-50732ad4-49b3-44c1-9b4d-fa5e73eb47d1)

7 Groups make presentations to the class, either Powerpoint presentations, or using photos or other images gathered in their research.

8 **ALTERNATIVE PRESENTATION FORMAT: Science Fair Format**

Groups may create posters including images and salient points about their chosen STEM Professional of Color. To view, groups travel around viewing the poster presentations, while one group member stays behind to present the poster.

9 Where possible, teachers are encouraged to create a Wall of STEM professionals of color, depicting photos and brief descriptions of the STEM professionals’ contributions. This can be a powerful reminder of both the silence surrounding their contributions as well as a celebration of their lives and work.
## STEM Professional of Color

Complete the chart below paraphrasing the information you find out about the STEM professional.

<table>
<thead>
<tr>
<th>Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>When S/he Lived</td>
<td></td>
</tr>
<tr>
<td>Occupation(s)</td>
<td></td>
</tr>
<tr>
<td>What S/he Does/Did</td>
<td></td>
</tr>
<tr>
<td>Where S/he Worked</td>
<td></td>
</tr>
<tr>
<td>How S/he Became One</td>
<td></td>
</tr>
<tr>
<td>Why we/I chose this person</td>
<td></td>
</tr>
<tr>
<td>Sources</td>
<td></td>
</tr>
</tbody>
</table>
Advantages and Disadvantages: How is Technology Affecting Education?

Students read multiple perspectives on how technology is affecting education, and use question stems to write their own questions. After reading and discussing, students debate the topics, then write about their own opinions on the topic in a quick-write or a short written response.

PREP

• Read the two possible writing assignments. Choose between version A (the quick-write) or version B (the short written response).

• Write on the board:

Do you think technology is more helpful, or more hurtful, to students’ learning?

MATERIALS

• Technology Changing How Students Learn, Teachers Say article
• Writing Your Response handout

EXPLAIN

1 Ask students to free-write a response to the question on the board.

2 After students have written, write HELPFUL on one side of the board, and HURTFUL on the other side of the board. Ask students to move to the side of the room that represents their opinion: if they think that technology is hurting students’ learning, move to that side of the room. If they think it’s helping, they should go to that side of the room. Facilitate a discussion by asking students on both sides of the room to share their opinions, providing reasons for their ideas.

3 Distribute the Technology Changing How Students Learn, Teachers Say article. Ask students to read the article and annotate any ideas or information that they can use to support their opinion, or ideas/information that might make them change their mind.
Write either *The Quick-Write* or *The Short Written Response* on the board, and ask them to complete this writing assignment. If using the Short Written Response, distribute the *Writing Your Response* handout and review it with students.

**Version A: The Quick-Write (3-5 sentences)**
Add to your freewrite from the beginning of class:

*One additional thing I learned from the New York Times article “Technology Changing How Students Learn, Teachers Say” is that…*

OR

*When I read the New York Times article, “Technology Changing How Students Learn, Teachers Say” it made me change my mind a bit because…*

**Version B: The Short Written Response**
Write a short response explaining your point of view about technology in education. It should be two paragraphs long, and explain two different reasons why you think technology is helping or hurting children’s education.
Technology Changing How Students Learn, Teachers Say

By Matt Richtel, November 1, 2012

Adapted from http://www.nytimes.com/2012/11/01/education/technology-is-changing-how-students-learn-teachers-say.html

There is a widespread belief among teachers that students’ constant use of digital technology is hampering their attention spans and ability to persevere in the face of challenging tasks, according to two surveys of teachers being released on Thursday.

The researchers note that their findings represent the subjective views of teachers and should not be seen as definitive proof that widespread use of computers, phones and video games affects students’ capability to focus. Even so, the researchers who performed the studies, as well as scholars who study technology’s impact on behavior and the brain, say the studies are significant because of the vantage points of teachers, who spend hours a day observing students.

The timing of the studies, from two well-regarded research organizations, appears to be coincidental. One was conducted by the Pew Internet Project, a division of the Pew Research Center that focuses on technology-related research. The other comes from Common Sense Media, a nonprofit organization in San Francisco that advises parents on media use by children. It was conducted by Vicky Rideout, a researcher who has previously shown that media use among children and teenagers ages 8 to 18 has grown so fast that they on average spend twice as much time with screens each year as they spend in school.

Teachers who were not involved in the surveys echoed their findings in interviews, saying they felt they had to work harder to capture and hold students’ attention.

“I’m an entertainer. I have to do a song and dance to capture their attention,” said Hope Molina-Porter, 37, an English teacher at Troy High School in Fullerton, Calif., who has taught for 14 years. She teaches accelerated students, but has noted a marked decline in the depth and analysis of their written work. She said she did not want to shrink from the challenge of engaging them, nor did other teachers interviewed, but she also worried that technology was causing a deeper shift in how students learned. She also wondered if teachers were adding to the problem by...
adjusting their lessons to accommodate shorter attention spans. “Are we contributing to this?” Ms. Molina-Porter said. “What’s going to happen when they don’t have constant entertainment?”

Scholars who study the role of media in society say no long-term studies have been done that adequately show how and if student attention span has changed because of the use of digital technology. But there is mounting indirect evidence that constant use of technology can affect behavior, particularly in developing brains, because of heavy stimulation and rapid shifts in attention.

Kristen Purcell, the associate director for research at Pew, acknowledged that the findings could be viewed from another perspective: that the education system must adjust to better accommodate the way students learn, a point that some teachers brought up in focus groups themselves. “What we’re labeling as ‘distraction,’ some see as a failure of adults to see how these kids process information,” Ms. Purcell said. “They’re not saying distraction is good but that the label of ‘distraction’ is a judgment of this generation.”

The surveys also found that many teachers said technology could be a useful educational tool. In the Pew survey, which was done in conjunction with the College Board and the National Writing Project, roughly 75 percent of 2,462 teachers surveyed said that the Internet and search engines had a “mostly positive” impact on student research skills. And they said such tools had made students more self-sufficient researchers. But nearly 90 percent said that digital technologies were creating “an easily distracted generation with short attention spans.”

Similarly, of the 685 teachers surveyed in the Common Sense project, 71 percent said they thought technology was hurting attention span “somewhat” or “a lot.” About 60 percent said it hindered students’ ability to write and communicate face to face, and almost half said it hurt critical thinking and their ability to do homework. There was little difference in how younger and older teachers perceived the impact of technology. “Boy, is this a call for a healthy and balanced media diet,” said Jim Steyer, the chief executive of Common Sense Media. He added, “What you have to understand as a parent is that what happens in the home with media consumption can affect academic achievement.”

In interviews, teachers described what might be called a “Wikipedia problem,” in which students have grown so accustomed to getting quick answers with a few keystrokes that they are more likely to give up when an easy answer eludes them. The Pew research found that 76 percent of teachers believed students had been conditioned by the Internet to find quick answers.

Lisa Baldwin, 48, a high school teacher in Great Barrington, Mass., said students’ ability to focus and fight through academic challenges was suffering an “exponential decline.” She said she saw the decline most sharply in students whose parents allowed unfettered access to television, phones, iPads and video games. For her part, Ms. Baldwin said she refused to lower her expectations or shift her teaching style to be more entertaining. But she does spend much more time in individual
tutoring sessions, she added, coaching students on how to work through challenging assignments.

Other teachers said technology was as much a solution as a problem. Dave Mendell, 44, a fourth-grade teacher in Wallingford, Pa., said that educational video games and digital presentations were excellent ways to engage students on their terms. Teachers also said they were using more dynamic and flexible teaching styles. “I’m tap dancing all over the place,” Mr. Mendell said. “The more I stand in front of class, the easier it is to lose them.” He added that it was tougher to engage students, but that once they were engaged, they were just as able to solve problems and be creative as they had been in the past. He would prefer, he added, for students to use less entertainment media at home, but he did not believe it represented an insurmountable challenge for teaching them at school.

While the Pew research explored how technology has affected attention span, it also looked at how the Internet has changed student research habits. By contrast, the Common Sense survey focused largely on how teachers saw the impact of entertainment media on a range of classroom skills. The surveys include some findings that appear contradictory. In the Common Sense report, for instance, some teachers said that even as they saw attention spans wane, students were improving in subjects like math, science and reading. But researchers said the conflicting views could be the result of subjectivity and bias. For example, teachers may perceive themselves facing both a more difficult challenge but also believe that they are overcoming the challenge through effective teaching. Pew said its research gave a “complex and at times contradictory” picture of teachers’ view of technology’s impact.

Dr. Dimitri Christakis, who studies the impact of technology on the brain and is the director of the Center for Child Health, Behavior and Development at Seattle Children’s Hospital, emphasized that teachers’ views were subjective but nevertheless could be accurate in sensing dwindling attention spans among students. His own research shows what happens to attention and focus in mice when they undergo the equivalent of heavy digital stimulation. Students saturated by entertainment media, he said, were experiencing a “supernatural” stimulation that teachers might have to keep up with or simulate. The heavy technology use, Dr. Christakis said, “makes reality by comparison uninteresting.”

Lisa Baldwin, a chemistry teacher, works with her students to fight through academic challenges. Credit Nancy Palmieri for The New York Times
**Writing Your Response**

Write TWO paragraphs in response to the question: Is technology helping, or hurting, students’ learning?

Each paragraph should be about ONE MAIN REASON that supports your claim. Use the template below:

**PARAGRAPH A:**

One reason I think technology helps/hurts students’ learning is…

**PARAGRAPH B:**

Another reason I think technology helps/hurts students’ learning is…
Reading and Writing to Give Advice: How Does Social Media Influence Teenagers?

Students discuss and read about the possible ways that social media can affect teenagers, then write a letter of advice to suggest and explain strategies for avoiding some of the pitfalls discussed in the reading.

PREP
- Read Social Networking’s Good and Bad Impacts on Kids article

MATERIALS
- Social Networking’s Good and Bad Impacts on Kids article
- Pros and Cons of Social Media for Youth graphic organizer
- My Advice to You: Social Media User handout

EXPLAIN
1. Create a social media wordwall by asking students to individually brainstorm and write down every word they think of when they think of the word Facebook. After a minute or two to brainstorm, ask students to report out, to create a word wall about social media. Teachers may write the words on chart paper on the board.

2. **Ask students:** How do you think social media affects children and teenagers?
   - Helps them be better connected to each other and the world, meet more people, join groups, find interests, distracts from other things, can cause fights, depression, anxiety, bullying.

3. You are going to read an article about how social media influences kids. You should annotate, making notes on the effects on youth of social media according to the article, as well as anything confusing or interesting. Distribute the article, Social Networking’s Good and Bad Impacts on Kids article.

4. When students have finished reading and annotating, ask them to find a partner and discuss interesting and confusing parts of the article, referring to their annotations.
5 When pairs are finished, ask them to turn the article over so they can’t see it. Explain that when they talk about an article without looking at it, it can help improve their memory of what they read, and also helps them make sure to talk about it in their own words. Distribute Pros and Cons of Social Media for Youth graphic organizer, and ask students to fill in as much of the graphic organizer as they can without looking at the article.

6 Once students are finished, ask them to look back at the article to see if they missed anything. They may add any additional pros and cons at this time.

7 When students are finished, create two two-columned lists on the board.

<table>
<thead>
<tr>
<th>LIST 1</th>
<th>LIST 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pros</strong></td>
<td><strong>Cons</strong></td>
</tr>
<tr>
<td>Why is this good?</td>
<td>Is there a solution?</td>
</tr>
</tbody>
</table>

8 Have students share their pros and cons with the class, listing them in the appropriate column and prompting them to answer the corresponding question about each pro or con.

9 Distribute My Advice to You, Social Media User and ask students to use ideas from the article and their worksheet to write a letter of advice to a child or young adult about social media use.
Social Networking’s Good and Bad Impacts on Kids
August 6, 2011


WASHINGTON—Social media present risks and benefits to children but parents who try to secretly monitor their kids’ activities online are wasting their time, according to a presentation at the 119th Annual Convention of the American Psychological Association.

“While nobody can deny that Facebook has altered the landscape of social interaction, particularly among young people, we are just now starting to see solid psychological research demonstrating both the positives and the negatives,” said Larry D. Rosen, PhD, professor of psychology at California State University, Dominguez Hills.

In a talk entitled, “Poke Me: How Social Networks Can Both Help and Harm Our Kids,” Rosen discussed potential adverse effects, including:

- Teens who use Facebook more often show more narcissistic tendencies and young adults who have a strong Facebook presence show more signs of other psychological disorders, including antisocial behaviors, mania and aggressive tendencies.

- Daily overuse of media and technology has a negative effect on the health of all children, preteens and teenagers by making them more prone to anxiety, depression, and other psychological disorders, as well as by making them more susceptible to future health problems.

- Facebook can be distracting and can negatively impact learning. Studies found that middle school, high school and college students who checked Facebook at least once during a 15-minute study period achieved lower grades than those who didn’t check as frequently.

Rosen said new research has also found positive influences linked to social networking, including:

- Young adults who spend significant time on Facebook are better at showing “virtual empathy” to their online friends than those who don’t spend as much time on FaceBook.

- Online social networking can help introverted adolescents learn how to socialize behind the safety of device screens.

- Social networking can provide tools for teaching in compelling ways that engage young students.

For parents, Rosen offered guidance. “If you feel that you have to use some sort of computer program to surreptitiously monitor your child’s social networking, you are wasting your time. Your child will find a workaround in a matter of minutes,” he said. “You have to start talking about appropriate technology use early and often and build trust, so that when there is a problem, whether it is being bullied or seeing a disturbing image, your child will talk to you about it.”

He encouraged parents to assess their child’s activities on social networking sites, and discuss removing inappropriate content or connections to people who appear problematic. Parents also need to pay attention to the online trends and the latest technologies, websites and applications children are using, he said.

“Communication is the crux of parenting. You need to talk to your kids, or rather, listen to them,” Rosen said. “The ratio of parent listen to parent talk should be at least five-to-one. Listen for five minutes and talk for one.”
## Pros and Cons of Social Media for Youth

<table>
<thead>
<tr>
<th>What is positive about social media for youth?</th>
<th>What is negative about social media for youth?</th>
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My Advice to You, Social Media User

Imagine that you are writing a letter to give advice to a young person, brother/sister, cousin or friend about social media. What advice do you give and why? Try to explain specific reasons for your advice, and make it as persuasive as possible.

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Dear ____________________,
Did you know...

The New York State Department of Education passed The Dignity Act in 2011, creating policies that help keep students safe from physical and emotional harm in schools? It includes guidelines, resources and trainings for teachers and schools to support all students. Recent additions include resources on creating safe school environments for transgender and gender-nonconforming students.

The U. S. Department of Education has many resources to address bullying, including cyberbullying. They can be found at www.stopbullying.gov.
In this series, students take an in-depth look at a Technology nonprofit that uses open-sourced designs and 3D printing to create free upper limb prosthetics for children and youth. The purpose of the case study is to give students a very detailed look at one Technology employer and learn about its history, organizational structure, client impact and career opportunities. The activities approach the organization from a number of angles, so students can more fully understand what it might be like to work with this or a similar organization.

**ACTIVITIES IN THIS SERIES**

6.1 • Videos and Note-taking: An Introduction to e-NABLE

6.2 • Percentage of Growth: The e-NABLE Community Foundation by the Numbers

6.3 • The Path from Volunteer to Employee: e-NABLE and Po Paraguay
Videos and Note-taking: 
An Introduction to e-NABLE

Students watch videos, practice note-taking, develop questions based on their note-taking and write short answers to their classmates’ questions. This activity does not address careers directly, but rather introduces a nonprofit organization that is largely volunteer-run. It explores an innovative technology with wide-reaching impacts for social good, while addressing the ways that volunteering can benefit a job seeker.

Note: This activity contains three videos that describe different aspects of the e-NABLE organization. Teachers may want to use one, two or all three videos.

PREP

1. If you have not completed the lesson on 3D printing in Unit 1, view and discuss this introductory video prior to this lesson with the class, so students are familiar with the technology.
   https://www.youtube.com/watch?v=Vx0Z6LplaMU

2. Familiarize yourself with the e-NABLE Community Foundation (ECF) at http://www.enablecommunityfoundation.org.

3. Preview the following videos:
   1. Kieran’s Hand:
      https://vimeo.com/132886713
   2. e-NABLE: Open Technology, Faster Progress:
      https://www.youtube.com/watch?v=-_VXnMf6ct8
   3. How 3D Printed Hands are Changing Kids’ Lives Around the World:
      https://www.youtube.com/watch?v=XQ8tPOqN7WE

4. Be prepared to explain the terms: prosthetic/prosthesis, open source, CAD, proprietary, democratize

VOCABULARY
prosthetic/prosthesis
open source
CAD
proprietary
democratize

MATERIALS
- This activity requires a computer and projector.
- Kieran’s Hand: Questions and Answers worksheet
- e-NABLE Questions for Group Discussion handout
EXPLAIN

1. Technology has and will continue to change our lives in many ways. Often technology is designed and used for social good, or to make people’s lives better. For example, motorized wheelchairs allow people living with disabilities to be independently mobile. Many kinds of technology from cell phones, to mapping devices, and digital reporting systems have helped to alleviate poverty all over the world. There are even more recent examples, such as UMoove, a company that has developed technology allowing people who are paralyzed to control their computing devices using only eye and facial movements. These kinds of technological advances are helping to transform people’s lives in positive ways.

2. What are some examples of “transformational” technologies that have made people’s lives better in the last 100 years?
   - Computers, artificial hearts, televisions, airplanes/jet engines, cell phones, MRI machines, ATMs, cars, air conditioning, radio broadcasting, audio and video recording, defibrillators, rockets, lasers, computer software, microwaves, the World Wide Web, robots, Smartphones, mobile internet, 3D printing, Artificial Intelligence, hybrid cars, mobile applications/apps, DNA sequencing, solar energy.

3. We’re going to take an in-depth look at a technology nonprofit called e-NABLE which uses 3D printing to dramatically change people’s lives for the better.

   What do you already know about 3D printing?
   - It creates 3D objects by laying down successive layers of material, such as plastic, until the entire object is created. It is also called additive manufacturing, and has been used to create many things from clothing to cars to houses. It is creating change across industries in the way objects are produced.

VIDEO 1


2. Distribute the Kieran’s Hand: Questions and Answers worksheet and direct students’ attention to the video screen. Ask them to write on the worksheet two predictions about the video based on the title.

3. Ask students to take notes on the video as they watch. They should describe what e-NABLE is and what the organization does. They should also make a note of anything they find interesting, surprising or confusing and write down any questions they have. Play the video.

4. When the video is finished, ask students to complete the rest of the worksheet.
5 Students should exchange papers with a partner and answer each others’ questions.

6 **Ask students:** What questions do you have about e-NABLE that didn’t get answered in the video? Write their questions on the board.

**VIDEO 2**

1 Now we’re going to learn more about e-NABLE in another video. Perhaps some of your questions from the first video will get answered in this next one. As you watch, take notes on anything that seems important, interesting, surprising or confusing and think about the following questions:

- What is open sourcing?
- What is the connection between open sourcing and the work e-NABLE does?
- What questions do you have?

2 **Show e-NABLE: Open Technology, Faster Progress:**
   https://www.youtube.com/watch?v=_-VXnMf6ct8

**DISCUSS**

- What questions that you had after the first video were answered in this video or what information do you now understand better?
- What new things did you learn from this video?
- Who is Jon Schull? Why is he important?
  > He is a scientist at RIT. He is the president of ECF and was the one who put the call out for people with 3D printers to start volunteering to print hands for people who need them.
- Who is Skip Meetze? What is his job?
  > He is one of e-NABLE’s designers that works in the lab at RIT.
- Who is Lusie? What is her favorite thing to do at school? Why is this important?
  > She is a girl with one hand and has received assistive mechanical hands from e-NABLE. Her favorite thing to do is stack cups at school. It is important because she wasn’t able to do it before she had the e-NABLE hand. Being able to stack cups at school has given her more self-esteem and her classmates think she is really great at doing it.
• What does it mean when a file or software is open-sourced?

   The term “open source” refers to something that can be modified and shared because its design is publicly accessible. When a file or software is open sourced it means that anyone can see or change the code to make it work differently.

• When someone invents something, do they usually share it with everyone and give it away for free?

   NO, usually the inventor patents the invention so they own the right to sell it and make sure no one else can copy it or use it without the inventor's permission. This is especially the case when the invention is valuable or has the potential to make a lot of money.

• What do you think are the advantages of open sourcing? What might be the disadvantages?

• Do the hand designs change over time? Why and how?

   The designs change and improve over time as people try them out, see what could be better, make adjustments and then share their work with others in the ECF community. They give feedback online through Google or Yahoo groups or through forums on the e-NABLE website. This feedback loop allows changes to be made quickly.

• The e-NABLE Community Foundation is a nonprofit organization and has enough funding now to have paid employees, but most of the people who design and print the assistive hands are volunteers, which means they don't get paid. Why would someone do this work for free?

   To help other people and make a difference in the world.

• Helping other people is one reason for doing volunteer work. How can volunteering assist someone seeking employment?

   They can develop new skills and gain experience, build personal and professional networks, enhance their resume and discover new interests that could lead to careers.

• What kinds of job skills do you think the volunteers are gaining by working on designs with open-sourced technology and creating prosthetic hands for people all over the world?

   Collaboration/working with others, communication, including communicating with people in various languages and countries, cooperation, expanding on someone else's idea, explaining ideas, documenting a process in writing, design and 3D printing skills.

• What questions about e-NABLE do you have now after watching the second video?
VIDEO 3

1. We’re going to watch one more short video about e-NABLE. As you watch, consider the following: While it’s true that the designers and printers comprise a worldwide network of volunteers, think about all the tasks that someone has to do and all the materials that are needed in order move an idea for an e-NABLE assistive device from someone’s mind all the way to the finished product being used by a child that might live in another city or country than the person who printed it. Take notes on anything that seems important, interesting, confusing or surprising. See if you can answer any of your questions from the previous videos while watching this next one. Write down any remaining questions you have.

2. Play How 3D Printed Hands Are Changing Kids’ Lives Around the World: https://www.youtube.com/watch?v=XQ8tPOqN7WE

3. When the video is finished, divide students into groups of four and distribute e-NABLE Questions for Group Discussion handout. Ask students to discuss the questions on the handout in their groups and afterwards, write down any questions the group still has about what they’ve learned.

4. When groups are finished, discuss any remaining questions and highlight the ways their knowledge of e-NABLE developed from one video to the next as they learned about, questioned and discussed the same topic multiple times allowing for connections and new discoveries to be made. Remind them of the process of:
   - Predicting
   - Taking notes on relevant points
   - Developing questions that can be answered by the videos
   - Developing questions for further investigation
   - Exchanging ideas with peers
Kieran’s Hand: Questions and Answers

Answer the questions below based on the video, *Kieran’s Hand*.

Write 2 predictions about this video based on the title:

1. After watching the video: Were your predictions correct? Explain why or why not.

2. What are prosthetics?

3. Why did Kieran want one?
Write 3 questions about facts from this video for a classmate to answer. Give your paper to a classmate and have them write the answers to your questions.

**QUESTION 1:**

Answer:

**QUESTION 2:**

Answer:

**QUESTION 3:**

Answer:
e-NABLE: Questions for Group Discussion

Discuss the following questions with your group. When you are finished, write down any questions your group still has about what you have learned.

1. In this last video, we saw a youth group learning about and making assistive mechanical hands for e-NABLE. As the e-NABLE community and foundation has continued to grow, they have started programs that now take place in educational and youth settings.
   - Do you think this is a good idea? Why or why not?
   - What kinds of jobs might this create at e-NABLE?
   - In addition to learning about 3D printing, what other skills do you think kids could learn from participating in this program?

2. In this video, we got to see a little more of the 3D printers at work.
   - Why do you think 3D printing is important?
   - Do you think 3D printing is going to change the world? Why or why not?
   - What would you 3D print if you could? Why?
   - What questions do you still have about 3D printing?

3. Last year, the e-NABLE Community Foundation hired paid staff with the support of $600,000 dollars in funding from Google. That’s more than a half a million dollars! How do you think they could use this money? Make a list of all the possible ways the money could be used. Think about all the jobs, materials, and services that go into making this organization successful.

4. Would you like to work or volunteer for e-NABLE? Why or why not?

Questions we have about e-NABLE or 3D printing:
Percentage of Growth: The e-NABLE Community Foundation by the Numbers

Students analyze data from the e-NABLE Community Foundation to practice calculating percentage of growth.

PREP

- Students should already be familiar with calculating percentages.
- Read *The e-NABLE Community Foundation Annual Report 2015* and complete *The e-NABLE Community Foundation: By the Numbers* worksheet in preparation for helping students with this activity.

MATERIALS

- *The e-NABLE Community Foundation Annual Report 2015* handout
- *The e-NABLE Community Foundation: By the Numbers* worksheet

EXPLAIN

The e-NABLE community started in 2011 after Ivan Owen, an American special effects designer, and Richard Van As, a carpenter in South Africa who lost his fingers in an accident, worked together to design and print what would become e-NABLE’s first prosthetic hand design. After hearing about the pair’s project on YouTube, Jon Schull, a professor at Rochester Institute of Technology, put out the call for volunteers to print prosthetic hands and arms, and the community began to grow into the worldwide e-NABLE community.

The e-NABLE Community Foundation, the nonprofit organization that now supports the e-NABLE community, grew out of this volunteer movement. Many nonprofit organizations begin as a group of volunteers who come together to work toward a common goal.

*Ask:* Why do you think a group of volunteers would choose to become a nonprofit, apply for grants, and hire employees?

- They want to continue to grow and expand the work they do and need money and paid staff in order to so. Employees are needed to manage projects and do administrative tasks. As people devote increasingly more time to their volunteer pursuits, they need to get paid for their work in order to survive.
Nonprofit organizations operate using grant money donated by other organizations and private donors who want to support the work they do. Because the donors want to know how their money is used, nonprofits are legally required to keep track of their work and write a report each year showing how they spent grant money, who the people are that they have served, and what kind of success or impact their services have had. The e-NABLE Community Foundation is very new as a nonprofit organization, having only started in 2014. In 2015, they released their first annual report showing the data on the work they have done and the impact it has had on people’s lives. Today we’re going to take a look at some of that data.

Distribute *The e-NABLE Community Foundation Annual Report 2015* and *The e-NABLE Community Foundation: By the Numbers* worksheet.

Ask students to read the annual report and complete the worksheet in pairs.

When students are finished, discuss their answers and any remaining questions as a class.
The e-NABLE Community Foundation Annual Report 2015

Source: http://www.enablecommunityfoundation.org/about/press/

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<th>ECF BY THE NUMBERS</th>
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<tr>
<td><strong>COMMUNITY STATS:</strong></td>
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<tr>
<td>2015: 7000 members in the G+ Community</td>
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<tr>
<td>2016: projected 9500 members with a growth rate of about 1% a week</td>
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| **DEVICES DELIVERED:** |
| 2015: over 1032 devices delivered in over 40 countries |
| 2016: 4332 devices delivered |

| **DEVICE DESIGNS:** |
| 2015: over 16 Designs for arms, hands and fingers |
| 2016: projected over 50 new device designs (including but not limited to arms, hands and task-specific designs) |

| **RECIPIENT REQUESTS:** |
| 2015: 1882 device requests received and processed |
| 2016: projected 6000 requests received and processed (some recipients will not qualify for current devices) |

| **VOLUNTEERS:** |
| 2015: Volunteers in over 40 countries |
| 2016: Projected volunteers in over 70 countries |

| **CHAPTERS AND AFFILIATES:** |
| 2015: 65 (includes k-12 school groups and post secondary chapters) |
| 2016: Projected 500 (includes k-12 school groups and post secondary chapters) |

G+ stands for Google Plus, a free online messaging forum.
Section 6.2

The e-NABLE Community Foundation: By the Numbers

Use the e-NABLE Community Foundation data found in the 2015 Annual Report to complete the following questions. Make sure to show all of your work.

1. How many more members are projected to be in the G+ (Google Plus) community in 2016 than there were in 2015? Show your work below.

2. Why is an increase in Google Plus members advantageous for e-NABLE?

3. How many more devices are projected to be delivered in 2016 than were delivered in 2015? Show your work below.

4. If the same number of devices are added in 2017 as were added in 2016, how many devices in total would be delivered in 2017? Show your work below.
Describe in 1-2 sentences how you arrived at the answer.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

What do you think a “device request” is? How many more devices are projected to be requested in 2016 than in 2015? Show your work below.

Between 2015 and the end of 2016, the number of countries with e-NABLE volunteers is expected to almost _____________.

Based on your understanding of the e-NABLE community, what are “chapter affiliates?”

The number of chapter affiliates in 2016 is expected to be more than __________ times the number of chapter affiliates in 2015. Show your work below.
It's hard to predict the success of a company or organization based on only one year of data. What if 2015 was just one good year? In order to make an educated guess, there are other factors we can take into account. Does the business serve an important need or function? Will that need continue to grow? Does it have the resources (money, employees, motivation) to keep growing? Is there anything that might get in the way or from continued growth?

Based on the data in the infographics, your calculations, and what you have learned about e-NABLE and the Enable Community Foundation, do you predict their numbers will grow over the next two years? Why or why not? List at least three reasons for your prediction.

1. 

2. 

3. 
The Path from Volunteer to Employee: e-NABLE and Po Paraguay

Using a jigsaw collaborative reading strategy, students read in groups about Po Paraguay, a nonprofit organization that developed out of the e-NABLE community. Then they answer questions about Po Paraguay’s journey to becoming a nonprofit, as well as the potential for volunteerism to build job skills and create opportunities for employment.

* The jigsaw is a reading strategy in which students read part of an article, then exchange information with students who have read other parts of the article, together forming an understanding of the whole. Through the activity, they practice reading comprehension, summarizing, presentation and communication, listening and synthesis.

PREP

- Read *e-NABLE and Po Paraguay* article (full article/teacher resource)

MATERIALS

- *e-NABLE and Po Paraguay* teacher resource article
- *e-NABLE and Po Paraguay Group* readings #1–4
- *Written Response: Po Paraguay* worksheet

EXPLAIN

1. The e-NABLE Community Foundation, whose annual report we analyzed in the previous lesson, isn’t the only nonprofit organization that exists as a result of the e-NABLE community. Using e-NABLE’s open-sourced designs, focus on collaboration, and mission to help make low-cost and free 3D-printed assistive technology, Po Paraguay began with two volunteers and has grown into a nonprofit organization with a team of 15 employees. **What do you think are the benefits of creating a nonprofit organization?**

   - There is a definitive structure, including employees with defined responsibilities, paid employees, the organization can continue to grow, help more people, assert quality control of products, apply for funding to help with the cost of operations.
Today we’re going to learn about one nonprofit business that e-NABLE inspired, Po Paraguay. We’re going to get into groups and each group will read about one aspect of Po Paraguay. Then, each person in the group will be responsible for being able to explain what they learned about Po Paraguay to students who had a different reading.

Divide students into four groups and distribute group readings 1-4. Each group will read one reading: 1, 2, 3 or 4.

While you read the article together, annotate it for anything you find important, interesting, surprising or confusing. Write down any questions you have in the margins. Remember: You will be responsible for explaining what you learned about Po Paraguay to members of other groups.

While students are reading, the teacher should write the following questions on the board:

What is the main idea of this reading? How do you know?
What are three details that support the main idea? Describe them in your own words.
What jobs or job skills were mentioned in the reading?
Was there anything that surprised you? Why?
What questions do you have?

When groups are finished reading and annotating the article, they should first discuss the questions on the board, then write down their own answers on a sheet of paper. Each student should have one set of written answers that they will use in sharing with a new group.

When groups are finished, divide students into new groups that include at least one member from each original group. A representative from each reading should be in every group. Each group member should share what they learned from their reading, using their written responses to support the discussion. Note to students they should not read from their answers, but use them to support an explanation of the reading to their new group members in their own words. As one student shares information, the other group members should take notes on anything they feel is important and any connections they see between their own reading and other group members’ readings.
7 When groups have finished sharing with each other, distribute the *Written Response: Po Paraguay* worksheet and ask groups to complete it together. When students begin to work on Question #6, discuss the difference between a task and a skill.

- A task is what a worker does, for example, answering phone calls. A skill includes the abilities a worker needs to have in order to complete the task well, for example, having effective communication.

8 When students are finished, have them share and discuss their answers with the class.

9 Discuss the jigsaw process. What steps were required to complete the jigsaw? What are the benefits of using a jigsaw, rather than having all students read the entire article? What were students’ experiences of it?
In early 2014, medical student Eric Dijkhuis and electronic engineer Fernando Vallese, both from Paraguay, found themselves stumbling onto the enablingthefuture.org website and explored the ever growing e-NABLE Community Google+ group where approximately 200 volunteers (now over 6500!) had started gathering and planning ways in which they were going to “change the world” with 3D printed hands.

The pair immediately volunteered to be translators and volunteers for the community with the aim to extend e-NABLE’s work into their home country and eventually their non-profit, Po Paraguay, was born.

Non-Profit, Po Paraguay, was formed to help get e-NABLE devices onto the people in Paraguay who are in need of assistive upper limb devices there.

Eric writes, “Po Paraguay ignited with e-NABLE. We were already working with 3D printing but as a hobby more than with a purpose. It is such an amazing technology and it wasn’t getting used to its full potential.

We found a barrier with e-NABLE’s method of giving hands away for free in Paraguay…donated hands for recipients by individual people with 3D printers was more a dream than a reality. With approximately 30 printers in my country, (counting very expensive prototyping type 3DS machines) it was unthinkable to address the big problem of lack of prosthetics in our country.

Less than 1% of the people who have contacted us have been able to try a prosthetic hand or arm. The government doesn’t have a set program to help these people and 3D printing is mostly unheard of as a technology here in Paraguay, and the logistics are complicated.”

To date, Po Paraguay has created 34 3D printed hands for people seeking assistive devices in their country, one of which is Elias (Elijah) who Eric describes as “Amazing and inspiring.”
Not only did Elias get his own 3D printed hand, but he immediately started volunteering with Po Paraguay to help design other assistive devices.

From the time Elias was about 13 years old, he had worked as a carpenter and after 20 years of work, he had a horrible accident with a saw that resulted in the loss of his right hand. He felt devastated and Paraguay’s national health care doesn’t give their people support with getting prosthetics. He was offered a myo-electric version in Foz De Iguacu Brazil and traveled to try it out but with the price being over $20,000 USD he returned “empty handed” back to Paraguay.

Eight months after his accident, he found Po Paraguay and his first 3D printed hand. Eric writes, “He got his hand and the transformation he went through was amazing. He lost weight, he cut his hair and got a job but most importantly... he started helping Po. With his help, we developed a utensils holder to cut food and a pick for playing the guitar. He's currently working with us as a Volunteer.”

A young 8-year-old girl named Lalyz also found her way to Po Paraguay. Eric shares her story: “Lalyz was born without a hand but the moment she saw Po’s 3D printed hands, she decided she wanted one! A red one. She wanted it to match her favorite new boots. The moment she started using the hand, it was as if she was born with it. She played with balls, poured water from one cup to another and even hi-fived people!”

Like many of our recipients, Po Paraguay has found that one of the biggest reasons for asking for a new hand is self-confidence boosting. Eric shares a story about Jorge, a 20 year old young man that lost his hand when he was 8 in a fireworks accident.

“Jorge never wanted a (prosthetic) hand because they were dull and looked like something out of a “Chucky Movie” or didn’t match his “Cool Groove.” When he saw Elias’s hand, he told his mum he wanted one but ONLY if it could be a black one with a “Golden touch.” We made him his “facha” hand—which means “cool hand” here. The one thing that really stood out to us and made us notice the full potential of all of this was the fact that this kid that had felt his whole life as the “odd one out” in a negative way because of his
“disability”…changed his social media profile picture to one where his new 3D printed Po hand was a flag of his proudness for being different! He also invited us to attend the first birthday party he had wanted to have after 12 years!

Again, we saw an entire transformation of a person. Not only in the physical aspect (being able to grab things is incredible), but most importantly in the psychological part of it all.”

Po Paraguay is currently setting goals to help 80 people in what is left of 2015 and are attempting to get some funding from their local government to triple the amount of users for 2016. They are doing academic research with the Universidad Nacional De Asuncion and the Universidad Catolica de Asuncion with the hands and are working hard to promote 3D printing as a tool for change in many ways.

Eric shares, “We can give hands…but hopefully others can create even greater things!”

“We have a dream of making these hands as common as having braces and that every single kid that needs one will be able to get one, modify it and improve it! Having a 3D printed hand at your reach whenever you want and with a design that you love, being able to mix and match it with your new clothes or your favorite team…is something we want not only in Paraguay but in the whole world!”

**How does Po Paraguay work?**

Eric explains, “We needed to guarantee the quality of the final product (printed hand) in order to get people to believe from the first moment that 3D printed assistive devices are not only a “band-aid” to a problem, but an actual solution. As you know, QC (quality control) is an issue when your model relies on having people around the country (many amateurs),
producing 3D printed assistive devices and that is why our current strategy relies on centralizing the production of the devices, at least in the first stage of the project.”

Po Paraguay works as a non-profit which provides the full process of getting a hand before, during and after the recipient is given a device.

Eric goes on to share more: “We strongly believe in user empowerment and that’s why the users that can pay for their hand, we ask them to pay a subsidized price so they stop feeling as people with a disability are receiving a charity gift for their condition...but making them feel like true owners of the hand with all the rights and privileges they get by having “bought” one. The people who can pay, end up paying about 80-150 USD for a hand and the one’s that cannot pay receive a full donation either by Po Paraguay or an independent donor (either a person or a company.)”

Po Paraguay has already created 34 devices and most of their recipients paid under $120 USD and many others received them for free thanks to donors. They are based out of Asuncion, Paraguay and have 8 full time employees and 8 other part time volunteers. Like many nonprofits, Po Paraguay has a small staff and their employees are responsible for a range of that may include design, printing/manufacturing, office administration, communication with clients, grant writing (to obtain funding), social media, graphic design, physical therapy, and many others.

“I’ll keep saying that e-NABLE has changed history and every single one of the volunteers has shaped the future in a good way! A big hug from Po Paraguay and all the users that are infinitely thankful to all of you!”
SECTION 6.3

READING #1

from e-NABLE and Po Paraguay

Adapted from http://enablingthefuture.org

In early 2014, medical student Eric Dijkhuis and electronic engineer Fernando Vallese, both from Paraguay, found themselves stumbling onto the enablingthefuture.org website and explored the ever growing e-NABLE Community Google+ group where approximately 200 volunteers (now over 6500!) had started gathering and planning ways in which they were going to “change the world” with 3D printed hands.

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**Written Response: Po Paraguay**

Use your notes and all that you learned from your reading and both groups to answer the following questions as completely as possible. Make sure to cite at least one piece of evidence from the article to support each answer.

1. Why do you think medical student, Eric Dijkhuis, and electronic engineer, Fernando Vallese, decided to create Po Paraguay as a nonprofit instead of remaining volunteers with e-NABLE?

2. Po Paraguay’s assistive devices have helped dozens of people who have physical impairments. The staff has also noticed there are other positive outcomes for their clients. Name two positive effects, in addition to improved physical ability, the assistive devices have had for their recipients and describe why these effects are important, both for the recipient and for Po Paraguay as an organization.

3. Why do you think that less than 1% of the people who have contacted Po Paraguay about their service have been able to try a prosthetic hand or arm? Can you think of any solutions to this problem?

4. What does Po Paraguay have in common with e-NABLE? How are they different?
5 Why does Po Paraguay charge their clients a fee for the assistive devices while e-NABLE provides them for free? What do you think about this?

6 Po Paraguay has 8 full time employees and 8 part time volunteers on their staff. Below are examples of some of their job responsibilities. For each responsibility, identify two specific tasks that you think are a part of that responsibility and at least two skills necessary to complete the tasks successfully. See the example below.

<table>
<thead>
<tr>
<th>Job Responsibility</th>
<th>Tasks Involved</th>
<th>Skills Necessary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication with Clients</td>
<td>1. Answer phone calls and email</td>
<td>1. Good verbal communication</td>
</tr>
<tr>
<td></td>
<td>2. Document client information including their location, contact info, and what kind of device they need</td>
<td>2. Good written communication</td>
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<td></td>
<td></td>
<td>3. Professionalism, positive attitude</td>
</tr>
<tr>
<td>Assistive Device Design and 3D Printing</td>
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<tr>
<td>Office Administration</td>
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<td></td>
</tr>
<tr>
<td>Social Media/Marketing</td>
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</tbody>
</table>

7 What was it like to collaborate with other students to answer questions together on the same topic? How is this connected to the work that e-NABLE and Po Paraguay do? How is this similar to the kind of collaboration that happens in other workplaces?
Life Hacker: Tech Resources to Make Your Life Easier*

Students use the Internet to research local and regional websites and mobile app resources that provide assistance and services with real life problems, then read scenarios about fictional people that could benefit from using them and match the people with the appropriate resource.

PREP

- Familiarize yourself with the resources:
  
  - Ready NYC mobile app*
  - LinkNYC website*
  - MyNYCHA mobile app*
  - NYC 311 mobile app*
  - Venmo website and mobile app
  - Exit Strategy mobile app
  - NYC Wifi & Coffee mobile app*

MATERIALS

- This activity requires computers and Internet access and/or cell phones
- Life Hacker Research worksheet
- Life Hacks for Real Life worksheet

EXPLAIN

1. What do you think of when you hear the word hacker?

2. Computer hacking is the practice of modifying computer hardware and software to accomplish a goal outside of the creator’s original purpose. People who engage in computer hacking activities are often called hackers. Computer hackers are often motivated by curiosity or the fun of a challenge. Although some people use their hacking skills for negative purposes, for many hackers, computer hacking is a real life application of their problem-solving skills. It’s a chance to demonstrate their abilities, not an opportunity to harm others.
Has anyone ever heard of a life hack? Can you explain what it is?

- A life hack is a nickname some people have given to clever tricks, strategies and tools that people can use to help manage their daily lives more easily and efficiently. It is called hacking, because like computer hacking, it uses something to accomplish a goal outside of its intended purpose. Life hacks include simple solutions to common problems, for example using a clothespin to hold a nail while you hammer it so that you don’t accidentally smash your fingers. Life hacks can also include technological tools, such as gadgets, apps and websites that are designed to help solve daily challenges faster, easier or more conveniently, such as using the Lyft app to get a ride instead of hailing a taxi or a Selfie Stick to help you take the perfect picture of yourself with your smartphone.

Designers and developers in the tech industry are constantly coming up with new ways to make the average person’s life easier, more efficient, less stressful and more productive. Today we’re going to research and learn about some technology resources that make people’s lives a little easier.

Distribute Life Hacker Research worksheet and ask students to conduct research online to complete it in pairs. Students can search for the apps and websites via Google or iTunes online. Point out to students they should include the word “app” when searching for an app, to make sure that they find the right information. Or ask students what they can include in their search terms to make sure they find the correct information.

When students have finished, distribute Life Hacks for Real Life worksheet and have pairs work to complete it.

When pairs have finished, discuss answers as a class.
# Life Hacker Research

Use the internet to research the following apps and websites. Describe in as much detail as you can, exactly what the resource is, how it works, and who might benefit from using it.

<table>
<thead>
<tr>
<th>Resource</th>
<th>What is it?</th>
<th>How does it work?</th>
<th>Who might benefit from it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ready NYC App*</td>
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<td>ABC Eats App*</td>
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<td>LinkNYC*</td>
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<td>MyNYCHA App*</td>
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<td>NYC 311 App*</td>
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<td>Venmo</td>
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<td>Exit Strategy</td>
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<tr>
<td>NYC Wifi &amp; Coffee*</td>
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</table>
Life Hacks for Real Life

Read the following scenarios, decide which technology resource might be a good “life hack” for the person in each situation and explain your answer. You may recommend more than one resource for each scenario.

1. Sharon lives in a 3 bedroom apartment in the Bronx with her partner, their two children and her mother. On three occasions in the last six months, their hot water has been turned off without warning and they have gone without it for more than a few days at a time. Sharon has tried to speak with the superintendent and the landlord about the problem many times, but either they do not respond to her calls or say they will fix the problem, but then it just happens again in another few weeks.

Which resource might help make Sharon’s life easier in this situation?

Explain your answer

2. Terrance and Sonia have been in Manhattan all day trying to buy the perfect decorations, party favors and food for their 10-year-old niece, Cassandra’s, surprise birthday party the following day. Now they are lost and trying to find a toy store someone suggested would have all kinds of unicorn toys, which are Cassandra’s favorite. Terrance forgot his phone at home and Sonia’s phone has run out of battery power. They need to charge Sonia’s phone and find directions to the toy store.

Which resource might help make their lives easier in this situation?

Explain your answer

3. Nasir and Jonathan go out to dinner and each want to pay for their own food. When the server brings the check at the end of their meal, he informs them that the restaurant has a “cash only” policy, but Jonathan only has a credit card with him. Nasir offers to cover Jonathan’s portion of the check, as long as Jonathan pays him back by the end of the night. Jonathan doesn’t want to go to an ATM to get cash because he’ll have to pay $5 or more in ATM and bank fees.

Which resource might help make their lives easier in this situation?
Section 7

Explain your answer

4 June loves to get where she is going on time. In fact, she prefers to arrive at least 20-30 minutes early. Today she has an appointment with a new potential client for her IT consulting business and wants to find the quickest possible route to the restaurant they have agreed to meet at. She knows it is in an area of the city that is notoriously very crowded and hard to navigate, so she needs to know about any possible train delays or potential short cuts to get where she’s headed.

Which resource might help make June’s life easier in this situation?

Explain your answer

5 William has had a persistent pain in his back and has decided to see a chiropractor. He has never been to one before, and wants to find one that is well recommended by patients. He has a busy class schedule at Borough of Manhattan Community College, so he will need to find a chiropractor near the college.

Which resource might help make William's life easier in this situation?

Explain your answer

6 Maya has a paper to write for her English class that is due tomorrow. She can’t get enough privacy or quiet time at her house because she lives with her two younger teenage sisters who are always yelling and having their friends over. The paper is likely going to take most of the day and night to finish, but she needs to stay close to home in case her sisters need anything. She lives uptown and her school library is all the way downtown. Maya is going to need to find a place to work that has internet access, outlets for her laptop and phone, that stays open late and has coffee to keep her awake.

Which resource might help make Maya’s life easier in this situation?
7 Jory and Yanise recently moved to Red Hook, Brooklyn. They have heard lots of stories from their neighbors already about how difficult it was for the community to survive and rebuild after Hurricane Sandy. They know living so close to the water puts them in a danger zone if another hurricane were to happen, but they really love their new neighborhood. One neighbor suggested they make an emergency plan as soon as possible, but they don’t know where to start or how an emergency plan is supposed to work.

Which resource might help make their lives easier in this situation?

Explain your answer

8 Vanessa lives in a city housing development with her younger brother and elderly mother. She is in charge of making sure the rent is paid on time and filing reports when things in their apartment break or aren’t working properly. Since Vanessa is in school and works full time, the time she has on the bus in between school and work is often the only time she has to herself. She needs to make the most of every minute she has and make sure all her responsibilities are taken care of, even in the face of her busy schedule.

Which resource might help make Vanessa’s life easier?

Explain your answer
When you start a company, it’s more an art than a science because it’s totally unknown. Instead of solving high-profile problems, try to solve something that’s deeply personal to you. If you’ve just solved your problem, you might have solved the problem for millions of [others too].

— Brian Chesky

After earning a Bachelor’s degree in Industrial Design from Rhode Island School of Design, Brian Chesky and his roommate, soon-to-be business partner, bought three air mattresses and hosted three paying overnight guests in their San Francisco apartment. Their business grew into Airbnb.com, a website that allows travelers to find places to stay overnight with local hosts, and gives local hosts an opportunity to make some money hosting guests. In 2015, Airbnb was estimated to be worth $20 billion. In 2016, Brian Chesky took The Giving Pledge, joining Bill Gates and Warren Buffet in promising to give the majority of their wealth away.


Photo: @Kmeron for LeWeb11 Conference @ Les Docks -Paris-